
PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Annual Stock Assessment - Cwt (Odfw)

BPA project number: 8906900

Contract renewal date (mm/yyyy): 1/2000 ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Oregon Department of Fish and Wildlife

Business acronym (if appropriate) ODFW

Proposal contact person or principal investigator:

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NPPC Program Measure Number(s) which this project addresses

7.1C, 7.2A.2, 7.2B, 7.2D, 7.2D.1, 7.2D.3, 8.3C, 8.4C, 8.4C.2, 8.4C.3, 8.4C.4, 8.4D

FWS/NMFS Biological Opinion Number(s) which this project addresses

ND- NMFS-BO-Basic Monitoring.

NMFS Hydrosystem Operations Biological Opinion- VIII.A.13 (Resonable & Prudent Alternative to the Proposed Action #13).

Other planning document references

Snake River Recovery Plan (2.1.d.5).

Short description

Apply coded-wire tags to production releases of coho and chinook salmon at ODFW Columbia Basin hatcheries for stock assessment of hatchery and wild salmon populations. Evaluate alternative marking techniques.

Target species

Coho salmon and chinook salmon.

Section 2. Sorting and evaluation

Subbasin

Systemwide. Tagged fish released in Lower Columbia Mainstem (Tanner Creek, Big Creek, and Youngs Bay), Sandy, Willamette, Umatilla and Yakima subbasins.

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
<input checked="" type="checkbox"/> Anadromous fish <input type="checkbox"/> Resident fish <input type="checkbox"/> Wildlife	<input checked="" type="checkbox"/> Multi-year (milestone-based evaluation) <input type="checkbox"/> Watershed project evaluation	<input type="checkbox"/> Watershed councils/model watersheds <input type="checkbox"/> Information dissemination <input type="checkbox"/> Operation & maintenance <input type="checkbox"/> New construction <input checked="" type="checkbox"/> Research & monitoring <input type="checkbox"/> Implementation & management <input type="checkbox"/> Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description
20543	Coded-wire Tag Program (Programatic Umbrella)
8201300	Coded-wire Tag Recovery Program
8906500	Annual Stock Assessment - CWT (USFWS)
8906600	Annual Stock Assessment - CWT (WDFW)
8906900	Annual Stock Assessment - CWT (ODFW)

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
20515	Mainstem Umbrella Proposal	Provides for stock assessment and monitoring in mainstem.
9000500	Umatilla Hatchery Evaluation	Tag coho for release in Umatilla Basin. Identification of hatchery fish in Umatilla Basin.
9306000	Select Area Fisheries	Mark coho for release in Youngs Bay. Provide comparison mark groups. Identification of hatchery fish in Youngs Bay.
8805304	Monitor Actions Implemented Under the Hood River Production Program.	Identification of hatchery fish in Hood River Basin.

9144	Monitor Natural Escapement & Productivity of John Day Basin Spring Chinoo	Identification of hatchery fish in John Day Basin.
9506300	Yakima/Klickitat Monitoring and Evaluation Program	Tag coho for release in Yakima Basin. Identification of hatchery fish in Yakima Basin.
9603301	Supplement and Enhance the Two Existing Stocks of Yakima R. Fall Chinook	Identification of hatchery fish in Yakima Basin.
9603302	Evaluate the Feasibility and potential Risks of Restoring Yakima R. Coho	Tag coho for release in Yakima Basin. Identification of hatchery fish in Yakima Basin.
9604000	Evaluate the Feasibility and Risks of Coho Reintroduction in Mid-Columbia	Identification of hatchery fish in Wenatchee and Methow Basins.

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1990	Tagged 1,109,798 chinook and coho	90% prod. fish assoc. with CWT
1991	Tagged 1,123,281 chinook and coho and collected 339 tags from returning adults	92% prod. fish assoc. with CWT
1992	Tagged 861,793 chinook and coho and collected 5,326 tags from returning adults	98% prod. fish assoc. with CWT 100% of groups met 30 rec./group
1993	Tagged 845,200 chinook and coho and collected 3,130 tags from returning adults	99% prod. fish assoc. with CWT 89% of groups met 30 rec./group
1994	Tagged 1,591,080 chinook and coho and collected 1,411 tags from returning adults	97% prod. fish assoc. with CWT 75% of groups met 30 rec./group
1995	Tagged 820,563 chinook and coho and collected 1,689 tags from returning adults	99% prod. fish assoc. with CWT 75% of groups met 30 rec./group
1996	Tagged 842,360 chinook and coho and collected 916 tags from returning adults	84% prod. fish assoc. with CWT 72% of groups met 30 rec./group
1997	Tagged 788,048 chinook and coho and collected 1,181 tags from returning adults	98% prod. fish assoc. with CWT 35% of groups met 30 rec./group
1997	Photonic tagged 32,333 coho, released in the spring of 1997. Recovered 8 jacks in the fall of 1997, from these marked groups.	Technical problems limited number of fish tagged. Low mortality and good mark retention from tagging to release (5 months). No photonic marks observed in jack recoveries.

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Insure all ODFW Columbia Basin hatchery coho and chinook production releases have a representative CWT group included in the release.	a	Review ODFW Columbia Basin hatchery production schedules to identify production releases, and identify tagging needs.
		b	Coordinate with ODFW fish identification section to coded-wire tag the identified groups.
		c	At least 1 month after tagging sample 500 fish from each CWT group for tag retention and adipose fin clip quality.
		d	Collect release information and file CWT report for each group tagged under objective 1. Data is reported to PSMFC and available through their on-line computer database.
2	Recover coded-wire tags from snouts of fish tagged under Objective 1 and released during 1996 to 1999: (1997 brood coho; 1995 to 1997 brood chinook).	a	Snouts are collected by region wide fishery sampling programs (including BPA project 8201300), at ODFW hatcheries, and on spawning ground surveys.
		b	Transport snouts from ODFW hatcheries and spawning ground surveys to the ODFW Fish Identification section for tag recovery and decoding.
		c	Compile and verify sampling and tag data. Report data to PSMFC, available through their on-line computer database.
3	Prepare annual report for all Oregon salmon hatcheries in the Columbia Basin..	a	Report results of coded-wire tagging and tag recovery in 2000.
		b	Compile release and recovery information for all CWT groups released from Oregon Columbia Basin hatcheries.
		c	Calculate percent survival, ocean catch distribution, and freshwater escapement for the last 5 completed brood years for all CWT groups released from Oregon Columbia

			Basin hatcheries.
4	Evaluate the technical, logistic, and biological feasibility of using alternative marking techniques to mark large numbers of juvenile salmon.	a	Work with Northwest Marine Technology to coordinate the use of tagging equipment and to provide for training ODFW employees in elastomer visual implant tagging techniques. Acquire necessary equipment, tags, and other supplies.
		b	Mark 75,000 juvenile coho salmon at Sandy hatchery with an elastomer visual implant tag placed in the jaw. This is the third and final year of this tagging at Sandy hatchery.
		c	Coded-wire tag the 75,000 elastomer visual implant tagged juvenile coho salmon at Sandy hatchery. A control group of 25,000 fish will also be coded-wire tagged with a distinct tagcode under Objective 1.
		d	Collect and record pre-release data pertaining to tag related mortality, fish size, tag retention, and tag visibility.
		e	Collect and summarize data from returning coho marked under this objective in 1998. Prepare progress report covering tagging techniques, tag retention and visibility, and survival rates.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	1/2000	12/2000	Representative CWT group with all production releases. Adequate quality of marks and number of marked fish at release.		58.00%
2	1/2000	12/2000	Recovery data available in a timely fashion for basin managers.		21.80%
3	11/2000	12/2000	Adequate number of mark recoveries for calculation of hatchery		6.30%

			performance measures.		
4	7/2000	12/2000	Adequate mark quality. Adequate number of marked fish released. In-hatchery and post- release performance comparable to control.		13.90%
				Total	100.00%

Schedule constraints

Production and release of hatchery salmonids in the Columbia Basin is regulated by NMFS under the Endangered Species Act. Specific groups to be tagged depend on funding for the production and tagging of hatchery salmon in Oregon.

Completion date

Ongoing

Section 5. Budget

FY99 project budget (BPA obligated): \$189,996

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	Proj. Supervisor, Tagging Supervisors, Temporary Taggers	%21	45,389
Fringe benefits	Supervisors - 35%, Taggers - 32%	%7	15,383
Supplies, materials, non-expendable property	Coded-wire tags = \$46,665; Visual implant tags = \$6,225	%30	64,099
Operations & maintenance	Obj 2. Tag rec. (est 3,643 @ \$8.65/head)	%15	31,512
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%0	
NEPA costs		%0	
Construction-related support		%0	
PIT tags	# of tags:	%0	
Travel	Mileage @ PerDiem	%1	2,879
Indirect costs	@ 35.5%	%26	56,538
Subcontractor		%0	
Other		%0	
TOTAL BPA FY2000 BUDGET REQUEST			\$215,800

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount (\$)
N/A		%0	
		%0	
		%0	
		%0	
Total project cost (including BPA portion)			\$215,800

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	\$222,000	\$228,500	\$235,000	\$242,000

Section 6. References

Watershed?	Reference
<input type="checkbox"/>	Blankenship, L. 1981. Coded-wire tag loss study. Washington Department of Fisheries, Technical Report No. 65, Olympia, Washington.
<input type="checkbox"/>	Hankin, D.G. and S.M. Mohr. 1990. Determination of levels of coded-wire tagging needed to support time/area harvest management. Final contract report to Klamath River Technical Advisory Team.
<input type="checkbox"/>	Jefferts, K.B., P.K. Bergman, and H.F. Fiscus. 1963. A coded-wire identification system for macro-organisms. Nature 198:460-462.
<input type="checkbox"/>	Jenkinson, D.W., and H.T. Bilton. 1981. Additional guidelines to marking and coded wire tagging of juvenile salmon. Canadian Technical Report of Fisheries and Aquatic Sciences No. 1051. 24 pages.
<input type="checkbox"/>	Lewis, M.A. 1996. Stock Assessment of anadromous salmonids. Oregon Department of Fish and Wildlife, Annual Progress Report, Portland, Oregon.
<input type="checkbox"/>	Lewis, M.A. 1996a. Review of capacity utilization at ODFW salmon hatcheries. Oregon Department of Fish and Wildlife, Information Report 96-8, Portland, Oregon.
<input type="checkbox"/>	Lewis, M.A., C. Mallette, and W.M. Murray. 1997. Annual coded wire tag program, Oregon missing production groups. Annual Report 1996, Bonneville Power Administration, Portland, Oregon.
<input type="checkbox"/>	Pacific Salmon Commission (PSC). 1995. Hatchery methodology workshop. Held January 10th through 12th 1995, Seattle, Washington.
<input type="checkbox"/>	Reisenbichler, R.R., and N.A. Hartmann. 1978. Effect of number of marked fish and years of repetition on precision in studies of contribution to a fishery. Oregon Department of Fish and Wildlife, Information Report 78-2, Portland, Oregon.

PART II - NARRATIVE

Section 7. Abstract

This program contributes to the annual assessment of hatchery and wild salmon populations throughout the Columbia Basin. Specifically, the goal of this project is to tag a statistically valid number of coho and chinook salmon from each production release at each hatchery to assist in basinwide stock assessment and for evaluation of hatchery programs. The project currently uses coded-wire tagging technology, based on established methods and procedures, for this marking. The project has a second goal of evaluating the technical and biological feasibility of alternative marking technologies. Annually, the data from these mark groups is used to estimate survival, catch distribution, ocean escapement and returns to hatcheries and spawning grounds. This data also documents long-term trends for evaluation of hatcheries, as surrogate data for critical stocks, and for comparison with other long-term data sets from throughout the region.

The Fish and Wildlife Program has goals for monitoring and evaluation (Section 3), restoration of wild stocks (Sections 4 and 7), improved passage around dams (Sections 5 and 6), increased hatchery effectiveness (Section 7), and improved stock assessment and harvest management (Section 8). This project is expected to contribute to these goals by providing annual monitoring, as well as a long-term consistent data base that contributes to modeling efforts such as used in the PATH project, and that can be used to address critical uncertainties identified in the Fish and Wildlife Program.

Section 8. Project description

a. Technical and/or scientific background

The first problem this project addresses is incomplete basinwide stock assessment. Prior to implementation of this project, and companion projects for WDFW and USFWS, not all hatchery salmon production releases in the Columbia Basin had an associated tag group (about 75% of Oregon hatchery production groups had an associated tag group for the 1985 to 1988 brood years). Without representative tagging of all hatchery production groups avoidable uncertainty is imposed on basinwide stock assessment. Accurate monitoring of the proportion of fish, from specific stock groups, in harvests, in hatchery returns, and in spawning ground counts is made more difficult. Thus, monitoring and ultimately modeling of population status, harvest rates on, and hatchery impacts to critical populations is compromised. The second problem this project addresses is monitoring and evaluation of hatchery production. Historic management of the Columbia Basin has relied on hatchery salmon production to mitigate losses in wild salmon production. Failure to representatively tag all hatchery production groups precludes post-release monitoring and evaluation of specific hatcheries, or production strategies within a hatchery. Therefore, hatcheries were evaluated based on numbers and weights of juveniles released rather than on the number of adults produced and where those adults returned. The third problem this project addresses is the need to identify all hatchery fish, regardless of hatchery of origin, in areas where they interact

with critical stocks. Current marking techniques are either expensive, not readily identified externally, or have negative effects of fish survival.

The first three objectives of this project (see Section 4 above) establish a program to address the first two problems above through the establishment of a comprehensive post-release production monitoring program at Oregon Columbia Basin salmon hatcheries. The tagging technique used is the coded-wire tag, as this is a tool that identifies the origin of salmon and steelhead when these fish are captured or recovered in fisheries, on spawning grounds, at hatcheries, or in juvenile and adult migrant traps. The coded-wire tag is a relatively inexpensive tool that allows managers to gain more information about groups of fish over a broader geographic area than the more expensive PIT tag. For example, coded wire tag recoveries have identified differences in ocean catch distribution of mid and upper Columbia River chinook stocks relative to lower river chinook stocks; as well as differences in survival between the same coho stock released in the Yakima River and the Umatilla River versus releases at Bonneville Hatchery.

The final objective (see Section 4 above) of this project began in 1997 to evaluate the technical and biological feasibility of alternative marking techniques. To date work has progressed on evaluation of photonic and visual implant elastomer tagging techniques. Identifying an affordable, easily recognizable marking technique for hatchery fish, that does not impose unacceptable negative effects on survival of the fish will be beneficial to hatchery mass marking programs. Mass marking of hatchery fish aids in basinwide stock assessment, in evaluation and monitoring of critical stocks, in management of hatchery broodstocks, and in management of harvest programs.

b. Rationale and significance to Regional Programs

The rationale for the project is to provide comprehensive stock assessment and hatchery salmon production monitoring data to regional management entities. The data generated from the coded-wire tag program will be useful, if not essential, in many goals and objectives of the 1994 Fish and Wildlife Program including the following. Survival and harvest information for Columbia Basin hatcheries is essential for determining prioritization and cost effectiveness of program measures (Section 3). Data from this project is used in prioritizing hatchery production programs (i.e. tule fall chinook production eliminated at two hatcheries). Data from this project is also being used in the Artificial Production Review for the Columbia Basin. Expanded marking of hatchery fish aids in identification of hatchery fish in wild populations and can be useful in determining which hatchery populations are appropriate indicators for specific wild fish populations in the basin (Section 4). Through 1997 there have been 8 observed recoveries, in areas above Bonneville Dam, of fish tagged by this project and released in areas below Bonneville Dam. Hatchery marking programs are essential in monitoring achievement of hatchery performance standards and in hatchery evaluations (Section 7). Data from this project was used in the IHOT project and is being used in the Artificial Production Review for the Columbia Basin. Data from this project is used in harvest evaluation and modeling efforts (Section 8). Coded-wire tag data is a critical component of harvest models used to evaluate and establish fishery management options. Also some of the groups tagged by this project are released in terminal areas and will be helpful in the exploration and evaluation of terminal fishing opportunities.

Expansion of fish marking programs is called for in the 1994 Fish and Wildlife Program (8.4D.1). It also assists in data collection needed for fishery model refinements (8.4D.3). The need for a hatchery monitoring and evaluation program is also identified in other basin plans. The Snake River Recovery Plan (2.1.d.5) and the Hydrosystem Operations Biological Opinion (VIII.A.13) both call for establishment of a comprehensive monitoring, evaluation and research program. The final objective of this project (see Section 4 above) is an evaluation of mass marking techniques. There is a well documented need to identify all hatchery fish in the basin for a variety of reasons including; monitoring straying rates of hatchery fish into wild spawning areas, removal of hatchery fish at fish trapping locations to prevent them from straying to wild spawning areas, management of hatchery broodstocks, and selective harvest of hatchery fish. Evaluation of mass marking techniques is specifically called for in the 1994 Fish and Wildlife Program (8.4C.3).

In summary the coded-wire tag program meets the goals of the 1994 Fish and Wildlife Program by allowing fishery managers to: (1) better account for proportions of weak and critical stocks in mixed stock fisheries from California to Alaska and especially in the mainstem Columbia; (2) better determine the number of fish of each stock, including weak stocks, annually returning to various escapement areas, including dams, hatcheries, and spawning grounds; (3) monitor, evaluate and reduce impacts to wild stocks by determining which hatchery practices result in reduced proportions of stray hatchery fish; and (4) determine which type of artificial production works best in terms of number of adult returns.

c. Relationships to other projects

This project is part of the Coded-Wire Tag Program Umbrella, which consists of four BPA funded coded-wire tagging projects. The other projects in this umbrella group are: Annual Stock Assessment - CWT (USFWS) (#8906500); Annual Stock Assessment - CWT (WDFW) (#8906600); and Coded-wire Tag Recovery Program (#8201300). The goal of this umbrella is to insure comprehensive monitoring and evaluation of all Columbia Basin Hatchery salmon production. Project numbers 8906500, 8906600 and 8906900 provide funding for coded-wire tagging, while project number 8201300 focuses on sampling for tagged fish in all recovery areas as well as data compilation and data management. Collectively these projects compose a multi-year, milestone-based program. Milestones for this program include:

- (1) Representative tag group with each hatchery production release;
- (2) Statistically valid number of observed recoveries per group (30);
- (3) Adequate sampling of recovery areas (20%);
- (4) Data available regionwide in a timely manner.

The umbrella group will have two coordination/oversight committees. The first “CWT Oversight Committee” will be responsible for setting and reviewing overall program goals and objectives, and significance to regional programs. The second “CWT Work Group” will be responsible for setting and reviewing daily operations, methods, and number of fish to tag.

The Coded-Wire Tag program also coordinates and plans tagging needs and funding of tagging at ODFW hatcheries in conjunction with the ODFW Stock Assessment Project, the Pacific Salmon Commission tagging program for Oregon, and ODFW field staff. All tagging, tag recovery and data reporting for ODFW (irrespective of funding source for the tagging) is done through a central ODFW Fish Identification Section. Thus equipment, personnel and expertise is shared among all projects funding tagging at ODFW hatcheries.

This project is also a component of the Mainstem Umbrella Proposal, geographic grouping, to address stock assessment and hatchery monitoring objectives for that management subbasin. This project provides similar data for hatchery programs in four other subbasins, Sandy, Umatilla, Yakima and Willamette.

d. Project history (for ongoing projects)

This project began in 1989 with the project number 89-069. The project number has remained essentially the same since then, Project #: 8906900. The project name was changed this year from “Annual Coded Wire Tag Program - Missing Production OR HTC (ODFW)” to Annual Stock Assessment – CWT (ODFW)”. A name change was suggested by the ISRP. The new name better reflects the projects goals and the relationships between the four projects in the Coded-Wire Tag Umbrella group. This project began as the result of a research proposal from the Northwest Power Planning Council’s Hatchery Effectiveness Technical Work Group, because of its direct association with their priority projects 2, 4 and 6. The monitoring and evaluation group, at their January 1989 meeting, went on record as supporting this project as a high basin priority. A committee of agencies and Tribal scientists met to approve the “experimental design”, prior to original submission of this project. Similar projects were developed for other agencies releasing hatchery salmon in the Columbia Basin (see Section 3 above). The project was originally designed to provide information relevant to the Columbia River Fish and Wildlife Program at that time. Specifically to provide data for evaluation and improvement of hatchery methods at each facility (Measure 200), provide data to contribute to regulation of harvest management (Measure 500), and provide data on the use of artificial propagation (Measure 700).

Fiscal year 2000 will be the projects eleventh year. Through 1997 the project has coded-wire tagged 8.0 million juvenile salmon, and there have been 14,000 tags recovered from these fish (Table 1). By the third year of the project almost all ODFW hatchery production groups were represented by a tag group. Logistical problems were mainly the cause of not obtaining this goal in the first two years, and in the small number of groups still not tagged. Generally, these problems involve ponding constraints, such as fish for two releases reared in a common pond, and unexpected changes in production that occur too late to schedule a tag group. The low percentage of production fish associated with a tag group in 1996 (84%, Table 1) was the result of two releases associated with the February 1996 flood. First, the flood destroyed the Stayton Pond facility, forcing the release of 7.0 million tule fall chinook before they could be marked. Second, in the confusion of the flood, the scheduled spring chinook release at Dexter hatchery went out without its associated tag group. This resulted in two tag groups released with the March release and none with the February release. Recent declines in

survival of hatchery fish have resulted in a very low (35% in 1997, Table 1) percentage of tag groups meeting the 30 observed tag recovery milestone. The elimination of two very low survival tule fall chinook production groups should partially offset this problem in the future. However, in reviewing recent returns for groups planned to be tagged in 2000 it became evident that there was a need to increase the tagging of Big Creek hatchery tule fall chinook. Currently 50,000 fish from this group are tagged by this project. To consistently meet the 30 observed recovery goal, over the history of the existing dataset, would require 200,000 fish tagged for this production release group. Since preliminary results for 1998 show continued low survival, this proposal recommends increasing tagging of Big Creek fall chinook from 50,000 to 200,000.

Information obtained from fish tagged under this project is also used to adjust hatchery rearing and release plans, prioritize hatchery production programs, and evaluate and adjust harvest management strategies. Tagging of tule fall chinook has shown low survivals over many years. This and other information was included in budget evaluations and ultimately led to elimination of tule fall chinook releases at Bonneville and Stayton Pond hatcheries. Tagging data has demonstrated dramatic variation in survival of hatchery coho salmon by month of release. This has resulted in changes in hatchery release strategies to reduce the risk of catastrophic survival failure by spreading production releases over several months instead of concentrating on a single release time.

Table 1. Accomplishments and results, in terms of project milestones for BPA project Annual Stock Assessment – CWT (ODFW). These milestones are: 100% of production fish releases associated with a coded-wire tag (CWT) group; and a minimum of 30 observed tag recoveries from each production group.

Year	Accomplishment	Result
1990	Tagged 1,109,798 chinook and coho	90% prod. fish assoc. with CWT
1991	Tagged 1,123,281 chinook and coho and collected 339 tags from returning adults	92% prod. fish assoc. with CWT
1992	Tagged 861,793 chinook and coho and collected 5,326 tags from returning adults	98% prod. fish assoc. with CWT 100% of groups met 30 rec./group
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1997	Tagged 788,048 chinook and coho and collected 1,181 tags from returning adults	98% prod. fish assoc. with CWT 35% of groups met 30 rec./group
1997	Photonic tagged 32,333 coho, released in the spring of 1997. Recovered 8 jacks in the fall of 1997, from these marked groups.	Technical problems limited number of fish tagged. Low mortality and good mark retention from tagging to release (5 months). No photonic marks observed in

	jack recoveries.
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Initial results with photonic tagging were unsatisfactory. Technical problems with tag application prevented fulfilling the goal of 2 groups of 25,000 fish tagged. One group was completely coded-wire tagged but only 52% received photonic tags, the second group all received both tags (CWT and photonic) but only 16,000 fish were tagged. In-hatchery performance appeared to be adequate as mortality from tagging to release (5 months) was very low, 0.20% and 0.02% for photonic tagged groups versus 0.29% and 0.16% for control group in the same pond, respectively. Tag retention was also good at release. Although these technical problems during marking appear to be correctable, results from the jack returns in the fall of 1997 were poor. Only 8 jacks were recovered from the two photonic tag groups. Of the 3 jacks recovered from the 100% CWT and photonic tagged group, none had detectable photonic marks. Of the 5 jacks recovered from the CWT group with 52% photonic marks, we expected 3 photonic tag recoveries but none had detectable photonic marks. Because of these results the program switched over to evaluation of visual implant elastomer tagging in 1998. Results of the first year of tagging will be available in the spring of 1999.

e. Proposal objectives

Objective 1) Insure all ODFW Columbia Basin hatchery coho and chinook production releases have a representative CWT group included in the release. Specific numbers of fish to be tagged in 2000 will depend on hatchery production goals and other tagging funding for the 1999 brood year. These will not be determined until late summer 1999. Tagging numbers for 2000 should be similar to 1999, with the exception of the increased tagging of Big Creek fall chinook. Planned tagging in 1999 for this project includes:

- a) 2 groups of 50,000 CWT fall chinook salmon with an expected survival of about 0.5%, and one group of 200,000 fall chinook salmon with an expected survival of about 0.1%,
- b) 2 groups of 25,000, 3 groups of 30,000, and 1 group of 50,000 CWT spring chinook salmon with an expected survival of about 1.0%,
- c) 14 groups of 25,000 CWT coho salmon with an expected survival of about 1.0%.

For a total of 840,000 fish in 23 CWT groups.

Objective 2) Recover coded-wire tags from snouts of fish tagged under Objective 1 and released during 1996 to 1999: (1997 brood coho; 1995 to 1997 brood fall chinook; 1995 to 1997 brood spring chinook). The goal is to have data from all tags recovered in 2000 available to the public through PSMFC by summer 2001. Salmon with a CWT are readily identified in the field by their adipose fin clip, or through electronic means for mass marked coho salmon. However, the specific tagcode can not be readily or easily determined in the field. Since recoveries occur and the data is used throughout the region it is essential that all tags and recovery data be read, data entered, varified, and available though standardized forms and methodologies. Thus, acuarate and reliable data is available to all users regionwide.

- Objective 3) Prepare annual report for all Oregon salmon hatcheries in the Columbia Basin. The report documents work performed for the year under this contract as well as summarizes data for the last five years for all ODFW Columbia Basin CWT groups. This provides a general reference for results of the project as well as baseline data analysis including numbers released, percent survival, ocean catch distribution, and freshwater catch and escapement. The report is to be completed 90 days after the end of the contract period, March 31, 2001 for the 2000 contract.
- Objective 4) Evaluate the technical, logistic, and biological feasibility of using alternative marking techniques to mark large numbers of juvenile coho salmon. Initial work with photonic tagging experienced technical problems and the emphasis was switched to visual implant elastomer tagging. Specific hypotheses include:
- a) No difference in mortality, growth, or disease occurrence during hatchery rearing. Assumes results with Sandy hatchery coho are representative of other hatchery coho, random assignment of fish to treatment and control groups, equal feeding rates between groups, accurate determination and recording of test variables.
 - b) Tags are retained and visible throughout the fishes life. Assumes results with Sandy hatchery coho are representative of other hatchery coho, random assignment of fish to treatment and control groups, marked adults are recognized and correctly assigned to treatment or control groups, results at the hatchery (maturing fish) are representative of ocean caught (immature fish).
 - c) No difference in post-release survival, growth, age composition or sex composition. Assumes results with Sandy hatchery coho are representative of other hatchery coho, random assignment of fish to treatment and control groups, marked adults are recognized and correctly assigned to treatment or control groups.

f. Methods

- Objective 1) Insure all ODFW Columbia Basin hatchery coho and chinook production releases have a representative CWT group included in the release. Specific tasks and methods follow:
- a) Determine groups to be tagged and number of fish to tag. This is a three step process. First, all production releases are identified, based on program intent (ongoing regular production to produce smolts), number of fish released (50,000 or more), and fish of an acceptable size (at least 2.0 gm/fish). Second, groups with adequate tagging funded by other sources are eliminated from the list. Finally, the number of fish to tag is determined based on the expected survival, generally 25,000 to 50,000 fish per group.
 - b) The identified groups of fish are tagged based on the manufactures recommendations and standard techniques for coded-wire tagging (Jenkinson and Bilton 1981).
 - c) Pre-release checks of 500 fish per group (PSC 1995) are made at least 4 weeks after tagging (Blankenship 1981).

- d) All release information is reported to the Pacific States Marine Fisheries Commission and is available on their on-line computer database.
- Objective 2) Recover coded-wire tags from snouts of fish tagged under Objective 1. Specific tasks and methods follow:
- a) Snouts collected from marked fish sampled in fisheries, hatcheries, and other recovery areas are frozen and transported to the ODFW Fish Identification head lab in Clackamas, Oregon.
 - b) Tags are recovered, read and stored using standard techniques. Tags recovered by other agencies are sent to the Clackamas lab for verification.
 - c) All recovery information is reported to the Pacific States Marine Fisheries Commission and is available on their on-line computer database.
- Objective 3) Prepare annual report. Specific tasks and methods follow:
- a) Compile release and recovery information from all CWT groups released in the Columbia Basin by ODFW.
 - b) Calculate survival (total estimated recoveries/number of tagged fish released) and catch distribution (percent of total recoveries by location) for each CWT group. Calculate 5 year averages of the above information by hatchery program (species/stock/release location) and display graphically.
 - c) Compile and submit report to BPA by 90 days after end of contract. Report published by BPA.
- Objective 4) Evaluate the technical, logistic, and biological feasibility of using alternative marking techniques to mark large numbers of juvenile coho salmon. This study should continue for 3 years. Specific tasks and methods follow:
- a) Mark one groups of 75,000 juvenile coho salmon at Sandy hatchery in summer 2000. Each fish will receive a code-wire tag (in the snout), an adipose fin clip, and a visual implant tag (in the jaw).
 - b) Collect and record data during hatchery rearing (from tagging through release) including daily mortality, daily amounts fed, monthly fish size, and monthly disease checks.
 - c) Pre-release checks of 500 fish per group (PSC 1995) are made at least 4 weeks after tagging (Blankenship 1981). Treatment and control groups (adipose fin clipped and coded-wire tagged under objective 1) will be released in May 2001.
 - d) Coho salmon jacks (2001) and adults (2002) collected at Sandy hatchery will be checked for fin clips and visual implant tags. Marked fish will be sampled for gender, length, and have their snouts removed for CWT recovery.

The adipose fin clip + coded-wire tag (Jefferts et al 1963) was chosen as the method of marking because its use is well established in the region, there is a regionwide sampling program for this mark, and there is an established regional data reporting, storing, and access system. In 1989 a committee of agency and tribal scientists recommended the number of fish tagged per group for this project be based on producing a minimum of 30 actual tag recoveries per group. Based on historic levels of survival, harvest, and sampling, the following levels of tagging should meet that goal; tag 25,000 for groups with expected survivals of 0.5% or higher, and tag 50,000 for groups with

expected survivals of 0.5% or lower. Some groups of 30,000 are used for Willamete Basin spring chinook to maintain equal sample size with ongoing ODFW research projects funding other tagging at those hatcheries. These levels generally agree with Reisenbichler and Hartmann (1978) who recommended tagging 25,000 fish per group for estimation of fish contribution. However, the increasing complexity of fisheries management regimes requires much higher levels of tagging (Hankin and Mohr 1990).

As a mark recapture project there are several critical assumptions including. 1) Adequate funding and staffing for sampling harvest and/or adult recovery areas. 2) Marked fish suffer the same natural mortality as unmarked fish. 3) Marked fish do not lose their marks. 4) All marks are recognized during sampling. As the technologies employed by this project are well established there are no special animal care or environmental protections required beyond the standard methodologies used for tagging. Since this project monitors existing activities we anticipate no change in existing risks to habitat, wild fish or wildlife directly related to this coded wire tagging project. Results of the project may provide data that can be used to reduce risks to other stocks through changes in management of hatchery production. Comparisons between different groups are analyzed by a two way ANOVA (treatments by years). Differences are considered statistical significant at $P \leq 0.05$. Visual implant tagging will be evaluated for cost, survival, mark retention, and mark visibility (pre and post release). Project results are monitored through annual reports and by reporting of all release and recovery information for coded-wire tagged groups through the Pacific States Marine Fisheries Commission. Results include monitoring and tracking trends in hatchery salmon survival, harvest, and escapement. This information will be used in basinwide stock assessment, to evaluate hatchery performance, and in managing fisheries.

g. Facilities and equipment

Coded-wire tagging for this project is performed at Oregon Columbia Basin hatcheries including: Big Creek, Bonneville, Cascade, McKenzie, Oxbow, Sandy, South Santiam, South Fork Klaskanine, and Willamette. For locations and descriptions of Oregon Columbia Basin salmon hatcheries see Lewis (1996a). Actual coded-wire tagging is performed by the ODFW Fish Identification section using standard tagging vans. Tagging vans are equipped with flowing water live tanks, anesthetic trays, flowing water recovery trays, and flowing water return tubes. Tagging is done with North West Marine Technology equipment including Mark 4 tagging machines and quality control devices. Tag recovery is done at the ODFW Fish Identification Head Lab in Clackamas, Oregon. Tags are recovered and read using standardize techniques, and equipment. These are the same tagging and tag recovery equipment used for all ODFW CWT projects. Equipment for alternative tagging techniques, Objective 4, will be supplied by the manufacturer.

Equipment and facilities needed for this project are available and adequately. No special or high-cost equipment purchases are currently anticipated.

h. Budget

Personnel costs (including fringe benefits) fund: project coordination, oversight, quality control and data reporting (project supervisor); daily tagging operation and tagger supervision (tagging supervisor); and actual tagging (temporary taggers). Supplies cover the cost of coded-wire tags, visual implant tags, and tagging supplies. Tag recovery costs ("Operation and Maintenance" in Section 5 Table) are calculated as estimated number of heads recovered in 2000, from fish tagged by the project in prior years, multiplied by the head recovery cost (cost of head lab operation divided by the number of head processed). Travel covers mileage and perdiem for tagging supervisors while tagging, and mileage for project supervisor for pre-release quality control checks. All costs are estimated based on prior years cost, adjusted for any salary increase, and planned tagging for the current year.

The estimated 2000 budget is \$25,804 higher than the 1999 budget. This is the result of the increased tagging for Big Creek fall chinook. Without this increase in tagging the estimated 2000 budget would be very similar to the 1999 budget. This budget estimate uses the ODFW 1999 indirect rate, which was a substantial increase from the 1998 indirect rate. However, the actual indirect rate for 2000 has not yet been established, and it is anticipated that it will probably be lower than the 1999 rate.

Section 9. Key personnel

Project Manager: Mark Lewis

Title: Special Projects (Natural Resource Specialist 2)

FTE/Hours: Full time position, 1.0 FTE. Time on this project 4 months/year, 0.33 FTE.

Duties on this Project: Write project proposals and project work statements, develop and track project budget, determine groups for tagging, coordinate tagging and tag recovery with ODFW Fish Identification Section, perform pre-release tag retention and fin clip quality checks, file CWT release reports, write annual reports, summarize and analyze data collected, prepare and deliver oral and written presentations of project results as needed.

Other ODFW employees involved with this project include: Christine Mallette Fish Identification Section supervisor; Bill Murray tag recovery supervisor; John Adkins, Stan Brzycki, Bill Close, Bill Haugen, Jenniffer Hewlett, Randy Johnson, and Gene Thoming tagging supervisors and/or tag processors.

Resume

Personnel: Mark Lewis Phone: (541) 757-4263 ex 241
28655 Highway 34 Fax: (541) 757-4102
Corvallis, OR 97333 email: lewisma@ccmail.orst.edu

College: Oregon State University, Graduated June 1986

Bachelors Degree in Fisheries Science, and Bachelors Degree in Wildlife Science

Current Employer: Oregon Department of Fish and Wildlife.

Assigned to Hatchery Assessment Project of the Fish Propagation Section of the Fish Division. Duties include: Project Manager for BPA contract; Project Manager for NMFS CWT contract; other projects, as assigned.

Recent Employment History: Current Position – March 1990 to Present.

North Coast Crew Chief – January 1990 to March 1990. Natural Resource Specialist 1 position with the ODFW Ocean Salmon Management Section. Assistant project manager for two projects; Sampling of Northern Oregon ocean salmon fisheries, and Salmon River fall chinook indicator stock project.

Seasonal Sampler – June 1986 to December 1989. Experimental Biological Aide position with various ODFW projects including: Oregon ocean sport and commercial fishery sampler, summer 1986, 1987, 1988. Oregon coastal salmon spawning ground surveyor, fall/winter 1986-87. Salmon river fall chinook indicator stock study, fall/winter 1987-88, 1988-89. Willamette River spring chinook creel, spring 1988. Salmon scale reader, summer 1989. Salmonid habitat research project, fall/winter 1989.

Foreign Fisheries Observer Program – July 1985 to September 1985, March 1987 to May 1987. Position with NMFS, subcontracted through OSU, collect biological and fishery management data from joint venture ground fish fishery in Bering Sea.

Expertise:

This project is essentially a mark-recapture project with hatchery salmon. My degrees in fisheries and wildlife science provide the biological and technical background to perform this kind of project. My work experience includes mark-recapture studies with juvenile wild salmon (salmonid habitat research project) and adult salmon (Salmon River fall chinook indicator stock project). I also have experience with the CWT technology including, tagging and sampling the various areas CWT fish are recovered. Computer use, data compilation and analysis, and report preparation skills have been developed through college courses and projects, as well as through my work experience on various projects.

Recent Publications and Job Completions:

Ewing, R.D., T.R. Walters, M.A. Lewis, and J.E. Sheahan. 1994. Evaluation of Inventory Procedures for Hatchery Fish. I. Estimating Weights of Fish in Raceways and Transport Trucks. *Progressive Fish-Culturist*. 56:153-159.

M.A. Lewis, T.R. Walters, and R.D. Ewing. 1994. Evaluation of Inventory Procedures for Hatchery Fish. II. Variation in Specific Gravities of Pacific Salmonids During Rearing. *Progressive Fish-Culturist*. 56:160-168.

Lewis, M.A. 1996a. Review of capacity utilization at ODFW salmon hatcheries. Oregon Department of Fish and Wildlife, Information Report 96-8, Portland, Oregon.

Lewis, M.A. 1996b. Stock Assessment of anadromous salmonids. Oregon Department of Fish and Wildlife, Annual Progress Report, Portland, Oregon.

Lewis, M.A., C. Mallette, and W.M. Murray. 1997. Annual coded wire tag program, Oregon missing production groups. Annual Report 1996, Bonneville Power Administration, Portland, Oregon.

Section 10. Information/technology transfer

Release information for all CWT groups released by ODFW in 2000 will be reported to PSMFC by early 2001. Recovery information for all CWT fish recovered by

ODFW in 2000 will be reported to PSMFC by summer 2001. This information will be available on PSMFC's on-line computer database for the region wide CWT program. An annual report "Annual Coded Wire Tag Program: Oregon Missing Production Groups" (Lewis et al 1997) is produced for this project. This report includes release and recovery data for all CWT groups released by ODFW in the Columbia Basin system (including those funded by other programs). Data from this project is also used in an ODFW annual report "Stock Assessment of Anadromous Salmonids" (Lewis 1996b) that reports release and recovery information for CWT groups released from coastal hatcheries and some Columbia Basin hatcheries. Information from this and other ODFW tagging projects is used to evaluate and adjust hatchery rearing and release techniques, to develop and evaluate fishery management decisions, prioritize hatchery production programs, evaluate hatchery/wild salmon interactions, and to monitor long-term trends in hatchery salmon production.

Congratulations!